INTEGRATED CIRCUITS, SILICON MONOLITHIC,

OCTAL D-TYPE FLIP-FLOP

BASED ON TYPE 54LS374

ESCC Detail Specification No. 9203/031

ISSUE 1

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Pages 1 to 29

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OCTAL D-TYPE FLIP-FLOP

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space components
coordination group

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Issue 2	November 1991	-	-
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This issue supersedes Issue 1 and incorporates all modifications agreed in the following DCR's:		
		Cover page	:	None
		DCN	:	None
		Table of Contents	: - Figure 2(a) amended	22881
			: - Figure (2b) added	22881
		Table 1(a)	: - Variants 05 and 06 amended	22881
			: - Variant 08 added	22920
			: - Variants 11 and 12 added	22881
		Figure 2	: Figure renamed into Figure 2(a)	22881
		Figure 2(a)	: New figure (Flat Package)	22920
		Figures 2(b) and (c)	: Figures renumbered from (a) and (b)	22920
		Figure 2(b)	: - Imperial dimensions deleted from table	22881
			: - In table, note references for E1, e, Q, S and α amended	22881
		Figure 2(c)	: New figure	22881
		Figures 2(a) to (c)	: Notes rewritten	22881/ 22920
		Figure 3(a)	: - 2nd outline on 'chip carrier package' added	22881
			: - Title of 1st outline added	22881/ 22920
			: - '(Top View)' added to the 2 outlines	22881
		Para 4.2.2	: Text amended (PIND deleted)	21048
		Para. 4.2.4	: Deviation replaced by 'None'	22919
		Para. 4.2.5	: Deviation replaced by 'None'	22919
		Para 4.3.2	: Weights of the flat and chip carrier packages added	23460/ 22920
		Para 4.4.2	: Para. rewritten	22881/ 22920
		Para 4.5.2	: - 'For dual-in-line- and flat packages' added at the beginning of the 1st sentence	22881/ 22920
			: - Last sentence added	22881
		Table 2	: Limits of items '99 to 106', '115 to 122' and '123 to 130' changed	23415
		Figure 4(f)	: Notes 1 and 2 renumbered as 1, 2 and 3	None
		Figure 4(i)	: Notes A to F renumbered 1 to 6	None
'A'	June '92	P1. Cover Page	:	None
		P2. DCN	:	None
		P3. Table of Contents	: Amended as relevant	None
		P11. Figure 3(b)	: Note amended	23519
		P16. Para. 4.5.3	: Wording amended	23519
		P16. Para. 4.6.3	: 'and functional test sequence' deleted	23519
		P16. Paras. 4.7.2 /4.7.3	: 'power' added before 'burn-in'	23519
		P27. Para. 4.8	: Title amended	23519
'B'	Sept. '94	P1. Cover Page		None
		P2. DCN		None
		P2A. DCN	: Page added	None
		P6. Table 1(a)	: Variant 02 added	23634
			: Variant 08 deleted	23634

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		P6. Table 1(b)	: No. 2, in Remarks, Note no. amended to "1"	23573
			: No. 3, in Remarks, Note no. amended to "2"	23573
			: No. 6, Existing temperature specified for DII/FP and note no. amended to "3"	23573
			: New temperature and note reference added for CCP	23573
			: Note 1 renumbered as "2"	23573
			: Note 2 renumbered as "3" and text amended	23573
			: Note 3 renumbered as "1"	23573
			: New Note 4 added	23573
		P8. Figure 2(b)	: Figure and Table amended	23592/ 23634
		P11. Figure 3(a)	: Pin notation added to Chip Carrier Package	23634
		P15. Para. 4.3.2	: Weights amended	221047

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TABLES

FIGURES

APPENDICES (Applicable to specific Manufacturers only)

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a silicon monolithic, low power bipolar Schottky, Octal D Type Flip-Flop, based on Type 54LS374. It shall be read in conjunction with ESA/SCC Generic Specification No. 9000 the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type integrated circuits specified herein, which are also covered by this specification are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the integrated circuits specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION (Figure 1)

Not applicable.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the integrated circuits specified herein are shown in Figure 2.

1.6 PIN ASSIGNMENT

As per Figure 3(a).

1.7 TRUTH TABLE

As per Figure 3(b).

1.8 CIRCUIT SCHEMATIC

As per Figure 3(c).

1.9 FUNCTIONAL DIAGRAM

As per Figure 3(d).

TABLE 1(a) - TYPE VARIANTS

Variant	Case	Figure	Lead Material and/or Finish
02	FLAT	2(a)	G4
05	DIL	2(b)	D7
06	DIL	2(b)	G4
11	CCP	2(c)	7
12	CCP	2(c)	4

TABLE 1(b) - MAXIMUM RATINGS

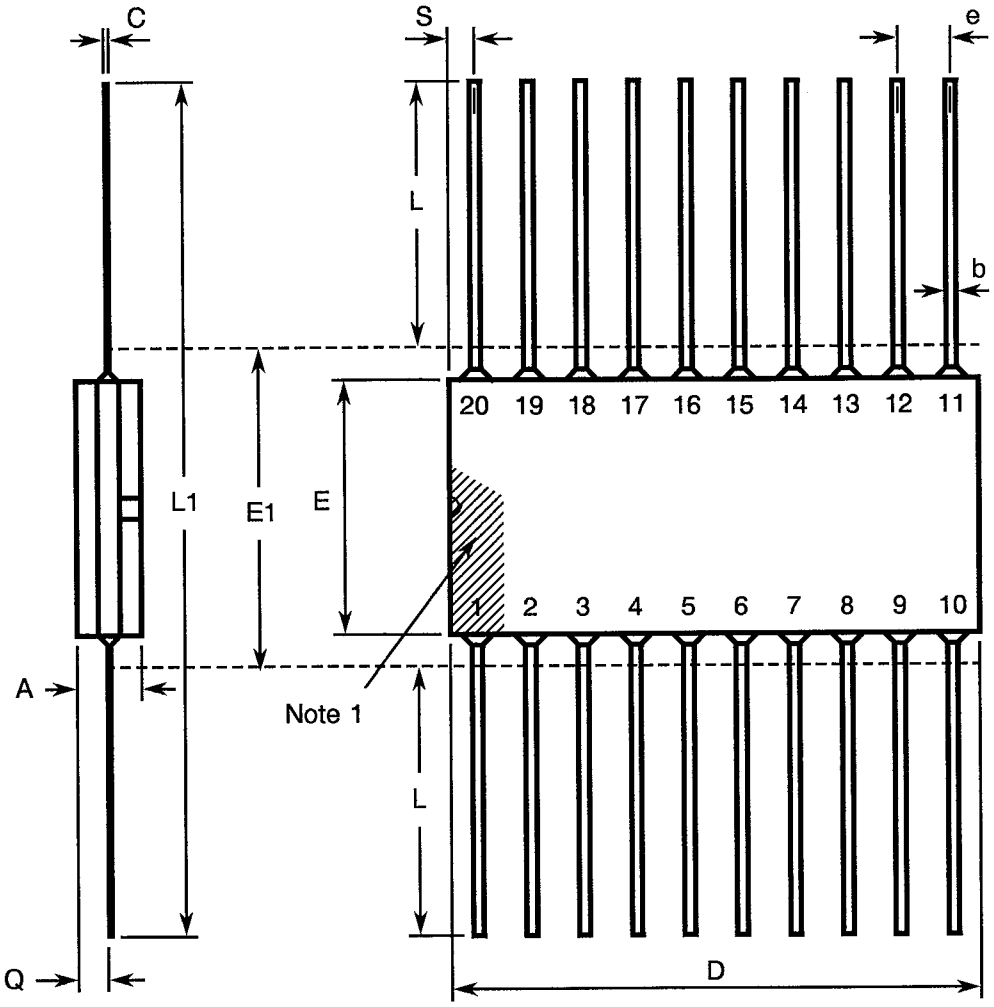
No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Supply Voltage	V_{CC}	-0.5 to 7.0	V	-
2	Input Voltage	V_{IN}	-0.5 to 7.0	V	Note 1
3	Device Dissipation	P_D	220	mWdc	Note 2
4	Operating Temperature Range	T_{op}	-55 to +125	°C	-
5	Storage Temperature Range	T_{stg}	-65 to +150	°C	-
6	Soldering Temperature For FP and DIP For CCP	T_{sol}	 +265 +245	°C	 Note 3 Note 4

NOTES

1. Input Current limited to -18mA.
2. Must withstand added P_D due to short circuit conditions (i.e. I_{OS}) at one output for 5 seconds.
3. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
4. Duration 5 seconds maximum and the same terminal shall not be resoldered until 3 minutes have elapsed.

FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - FLAT PACKAGE

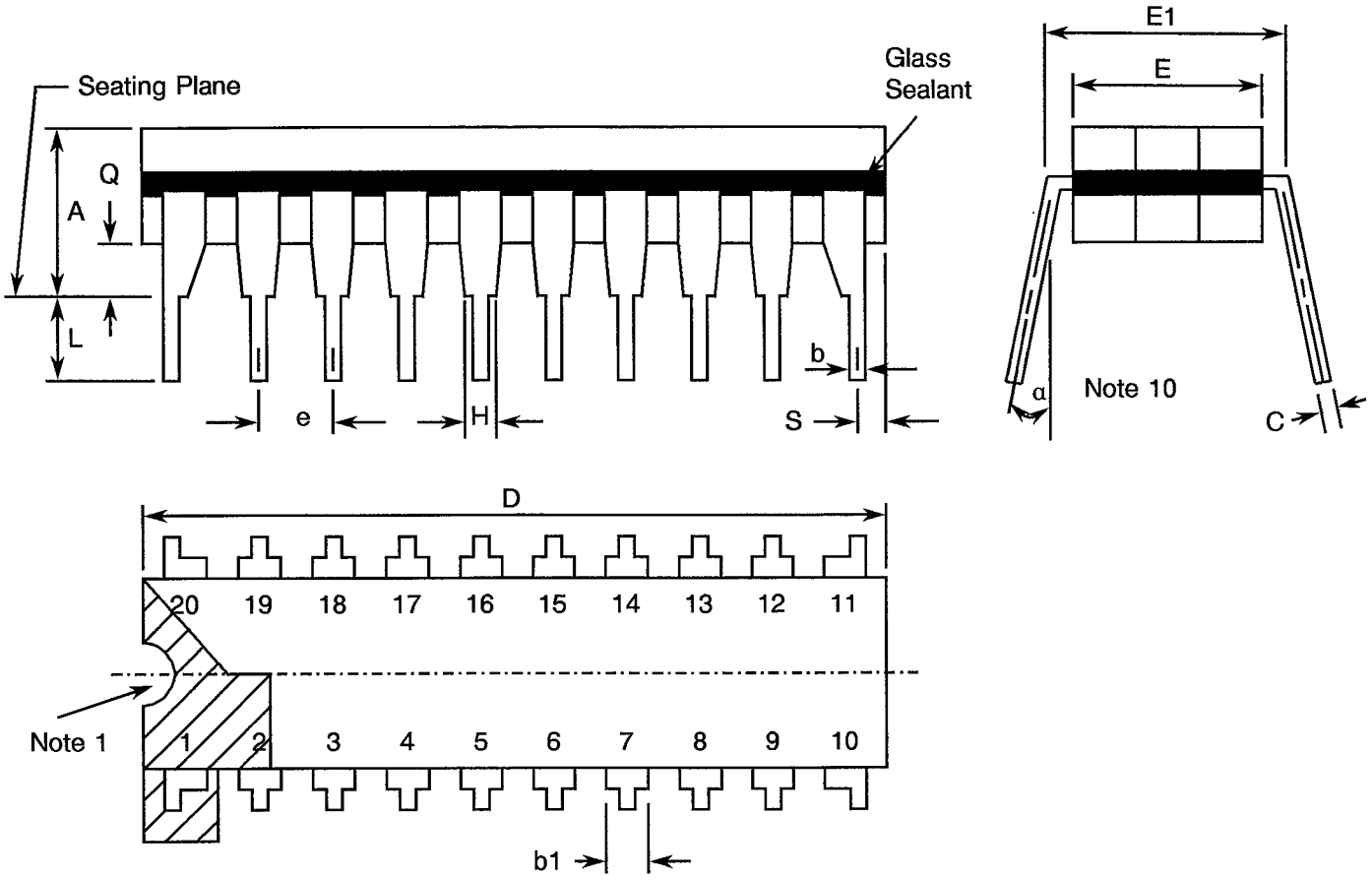


SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	1.14	2.34	
b	0.38	0.56	8
C	0.08	0.23	8
D	-	12.95	4
E	6.60	7.65	
E1	8.15 TYPICAL		4
e	1.27 TYPICAL		5, 9
L	6.35	9.40	8
L1	18.90	25.90	
Q	0.25	1.02	2
S	0.13	1.14	7

NOTES: See Page 10.

FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(b) - DUAL-IN-LINE PACKAGE

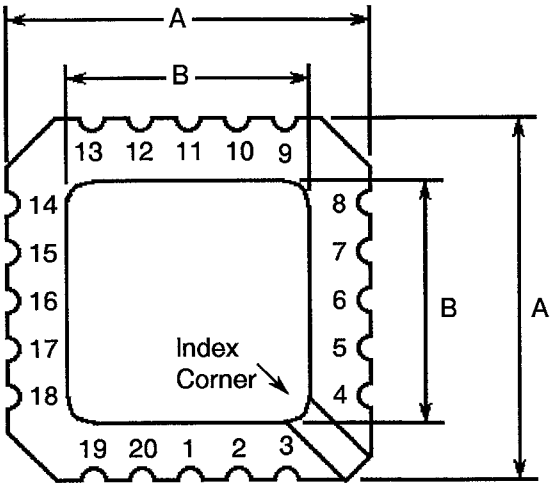


SYMBOL	MILLIMETRES		NOTES
	MIN	MAX	
A	-	5.08	
b	0.38	0.66	8
b1	-	1.78	8
C	0.20	0.44	8
D	23.62	24.76	4
E	6.22	7.62	4
E1	7.37	8.13	
e	2.54 TYPICAL		6, 9
F	1.27 TYPICAL		
H	0.76	-	
L	3.30	5.08	8
Q	0.51	-	3
S	0.38	1.27	7
α	0°	15°	10

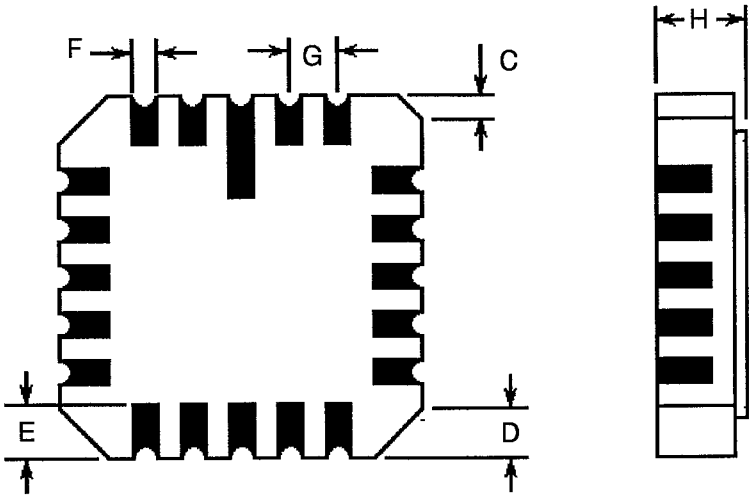
NOTES: See Page 10.

FIGURE 2 - PHYSICAL DIMENSIONS (Continued)

FIGURE 2(c) - SQUARE CHIP CARRIER PACKAGE (3 LAYER BASE)



20 Terminal



Symbol	Millimetres		Notes
	Min.	Max.	
A	8.687	9.093	
B	7.798	9.093	
C	0.250	0.510	11
D	0.889	1.143	12
E	1.140	1.400	8
F	0.559	0.712	8
G	1.27 Typical		5, 9
H	1.630	2.540	

NOTES: See Page 10.

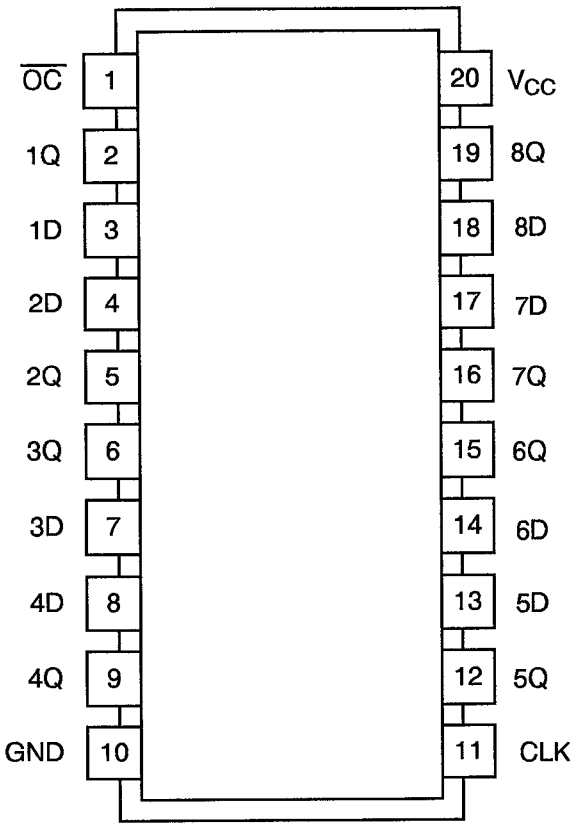
FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

NOTES TO FIGURES 2(a) to 2(c)

1. Index area; a notch or a dot shall be located adjacent to Pin 1 and shall be within the shaded area shown. For chip carrier packages the index shall be as defined in Figure 2(b).
2. Dimension Q shall be measured at the point of exit of the lead from the body.
3. Dimension Q shall be measured from the seating plane to the base plane.
4. This dimension allows for off-centre lids, meniscus and glass overrun.
5. The true position pin or terminal spacing is 1.27mm between centrelines. Each pin or terminal centreline shall be located within ± 0.13mm of its true longitudinal position relative to Pins 1 and 20
6. The true position pin spacing is 2.54mm between centrelines. Each pin centreline shall be located within ± 0.25mm of its true longitudinal position relative to Pins 1 and 20.
7. Applies to all four corners.
8. All leads or terminals.
9. 18 spaces for flat and dual-in-line packages.
   16 spaces for chip carrier packages.
10. Lead centre when α is 0°.
11. Index corner only - 2 dimensions.
12. 3 non-index corners - 6 dimensions.

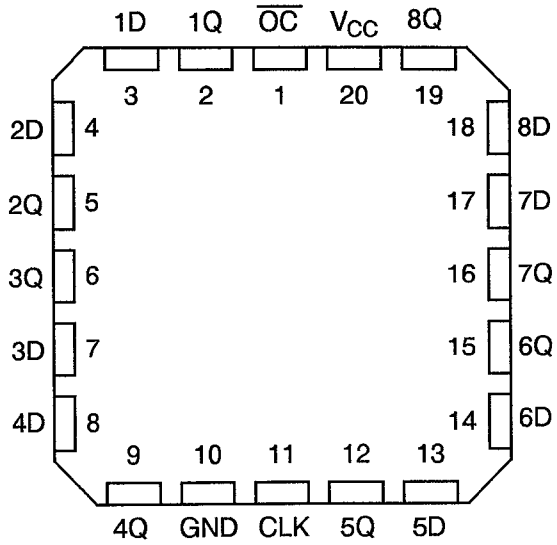
FIGURE 3(a) - PIN ASSIGNMENT

DUAL-IN-LINE AND FLAT PACKAGE



(TOP VIEW)

CHIP CARRIER PACKAGE



(TOP VIEW)

FIGURE 3(b) - TRUTH TABLE (EACH BUFFER)

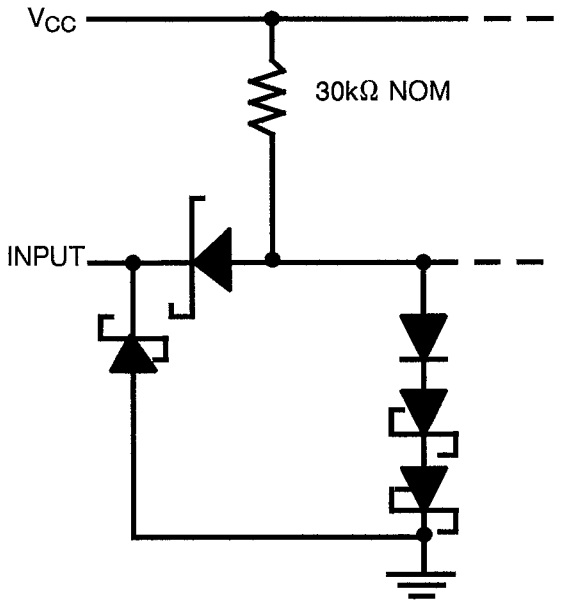
TRUTH TABLE, EACH FLIP-FLOP			
OUTPUT CONTROL	CLOCK	D	OUTPUT
L	↑	H	H
L	↑	L	L
L	L	X	Q_o
H	X	X	Z

NOTES

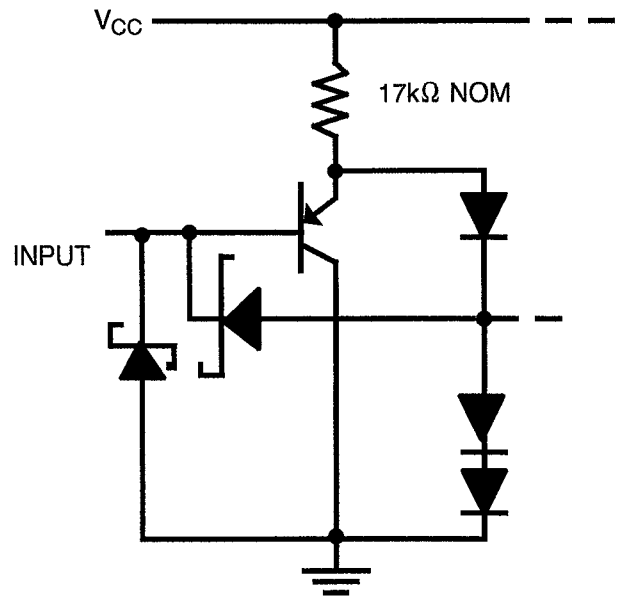
1. Logic level definitions: H = High Level, L = Low Level, X = Don't care, ↑ = Transition from Low to High Level, Q_o = level of Q before indicated steady state input conditions were established.

FIGURE 3(c) - CIRCUIT SCHEMATIC

EQUIVALENT OF DATA INPUTS



EQUIVALENT OF CLOCK AND OUTPUT CONTROL INPUTS



TYPICAL OF ALL OUTPUTS

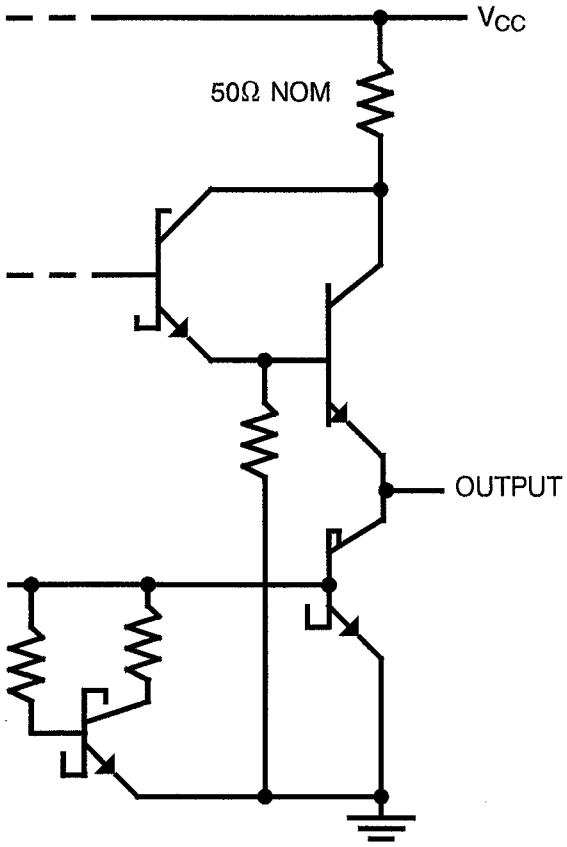
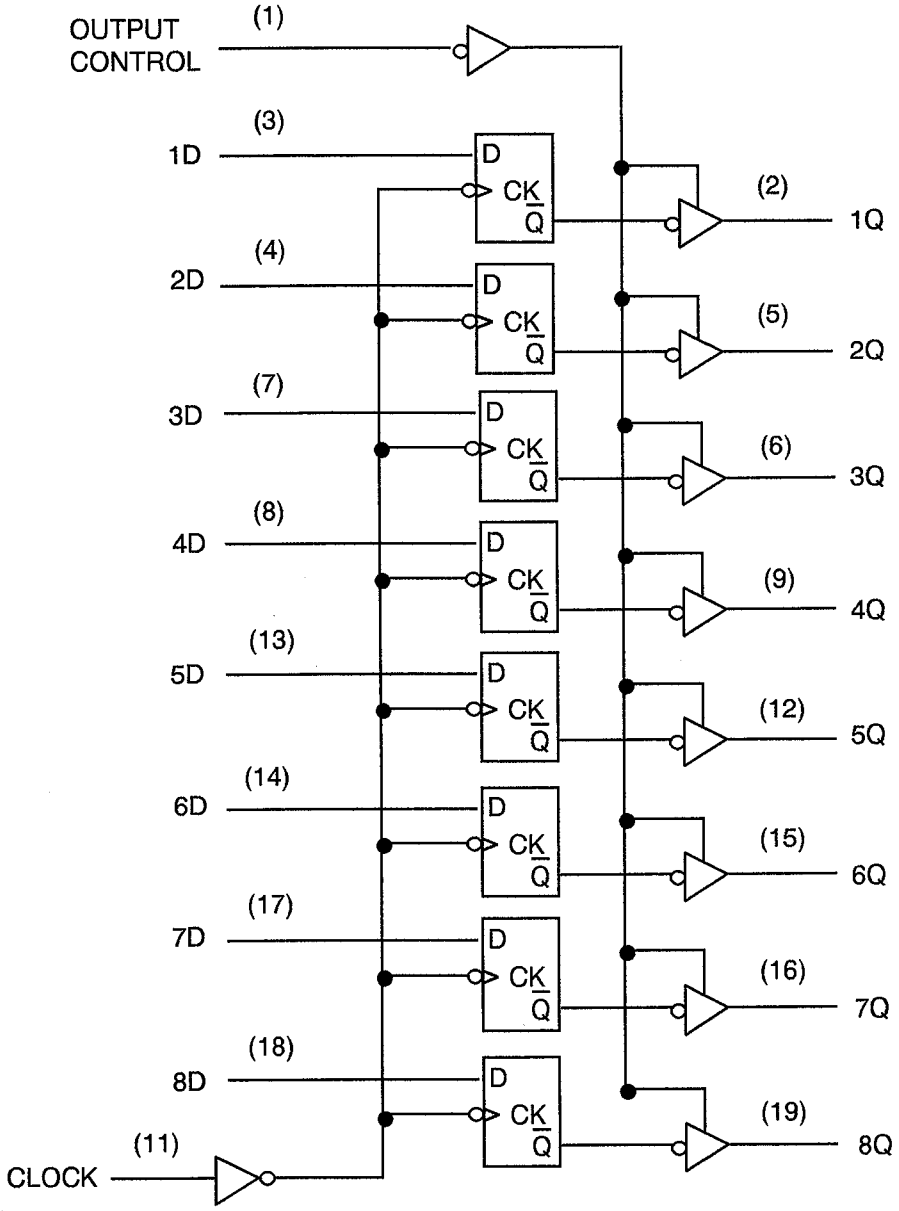


FIGURE 3(d) - FUNCTIONAL DIAGRAM



2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESA/SCC Generic Specification No. 9000 for Integrated Circuits.

(b) MIL-STD-883, Test Methods and Procedures for Micro-electronics.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply. In addition the following abbreviations are used:

V_{IC} = Input Clamp Voltage

V_{CC} = Supply Voltage

I_{CC} = Supply Current, Outputs High

I_{OZH} = Off State, Output Current High

I_{OZL} = Off State, Output Current Low

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the integrated circuits specified herein are as stated in this specification and ESA/SCC Generic Specification No. 9000 for Integrated Circuits. Deviations from the Generic Specification applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Control

None.

4.2.2 Deviations from Final Production Tests (Chart II)

None.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

(a) Para. 7.1.1(a), High Temperature Reverse Bias test and subsequent electrical measurements related to this test shall be omitted.

(b) Para. 9.9.2, Electrical Measurements at High and Low Temperatures: Only a test result summary, based on go-no-go tests and presented in histogram form, is required.

4.2.4 Deviations from Qualification Tests (Chart IV)

None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the integrated circuits specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the integrated ciruicts specified herein shall be 0.9 grammes for the flat package, 3.2 grammes for the dual-in-line package and 0.6 grammes for the chip carrier package.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the integrated circuits herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be hermetically sealed and have a metal body with hard glass seals or a ceramic body and the lids shall be welded, brazed, preform-soldered or glass frit-sealed.

4.4.2 Lead Material and Finish

For dual-in-line and flat packages, the lead material shall be either Type 'D' or Type 'G' with either Type '4' or Type '7' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. For chip carrier packages, the finish shall be either Type '4' or Type '7' in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

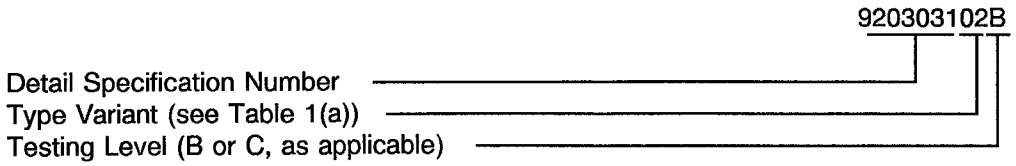
(c) Traceability Information.

4.5.2 Lead Identification

For dual-in-line and flat packages, an index shall be located at the top of the package in the position defined in Note 1 to Figure 2 or, alternatively, a tab may be used to identify Pin No. 1. The pin numbering must be read with the index or tab on the left-hand side. For chip carrier packages, the index shall be as defined by Figure 2(c).

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:-



4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ± 3 °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at T_{amb} = +125(+0-5) °C and -55(+5-0) °C respectively.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = +22 ± 3 °C. The parameter drift values (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 9000. The conditions for power burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuit for Power Burn-in

Circuit for use in performing the power burn-in test is shown in Figure 5 of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - D.C. PARAMETERS

No.	Characteristics	Symbol	Test Method MIL-STD-883	Test Fig.	Test Conditions (Pins under Test)	Limits		Unit
						Min.	Max.	
1	Functional Test	-	-	3(b)	Verify Truth Table with Load. Note 1	-	-	-
2 to 11	Input Current High Level 1	I_{IH1}	3010	4(a)	V_{CC} = 5.5V, V_{IN} = 2.7V (Pins 1-3-4-7-8-11-13-14-17-18)	-	20	µA
12 to 21	Input Current High Level at Max. Voltage	I_{IH2}	3010	4(a)	V_{CC} = 5.5V, V_{IN} = 7.0V (Pins 1-3-4-7-8-11-13-14-17-18)	-	100	µA
22 to 31	Input Clamp Voltage	V_{IC}	3008	4(b)	V_{CC} = 4.5V, I_{IN} = -18mA (Pins 1-3-4-7-8-11-13-14-17-18) Note 2	-	-1.5	V
32 to 41	Input Current Low Level	I_{IL}	3009	4(c)	V_{CC} = 5.5V, V_{IN} = 0.4V (Pins 1-3-4-7-8-11-13-14-17-18)	-	-400	µA
42 to 49	Output Voltage Low Level	V_{OL}	3007	4(d)	V_{CC} = 4.5V, I_{OL} = 12mA V_{IL} = 0.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	0.4	V
50 to 57	Output Voltage High Level	V_{OH}	3006	4(e)	V_{CC} = 4.5V, I_{OH} = -1mA V_{IL} = 0.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	2.4	-	V
58 to 65	Off State Output Current High Level Applied	I_{OZH}	-	4(h)	V_{CC} = 5.5V, V_{OUT} = 2.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	20	µA
66 to 73	Off State Output Current Low Level Applied	I_{OZL}	-	4(h)	V_{CC} = 5.5V, V_{OUT} = 0.4V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	-20	µA

NOTES: See Page 18.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - D.C. PARAMETERS (CONTINUED)

No.	Characteristics	Symbol	Test Method MIL-STD-883	Test Fig.	Test Conditions (Pins under Test)	Limits		Unit
						Min.	Max.	
74 to 81	Short Circuit Output Current	I_{OS}	3011	4(f)	V_{CC} = 5.5V (Pins 2-5-6-9-12-15-16-19) Note 3	-30	-130	mA
82	Supply Current	I_{CC}	3005	4(g)	V_{CC} = 5.5V (Pin 20)	-	40	mA

NOTES:

1. Go-no-go test with V_{IL} = 0.3V; V_{IH} = 3.0V; trip point 1.5V.
2. All inputs and outputs not under test shall be open.
3. No more than one output should be shorted at a time, and only for 1 second maximum. I_{OS} measurement may be performed with V_{OUT} = 2.25V instead of 0V. In this case, the limits are divided by 2.
4. Propagation delay measurements shall be performed as a go-no-go test on a 100% basis. Read-and-record measurements shall be performed on an LTPD7 sample basis following the Chart III Burn-in test.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - A.C. PARAMETERS

No.	Characteristics	Symbol	Test Method MIL-STD-883	Test Fig.	Test Conditions (Pins under Test) (Note 4)	Limits		Unit
						Min.	Max.	
83 to 90	Propagation Delay Low to High, from Clock to any Q	t_{PLH}	-	4(i)	V_{CC} = 5.0V C_L = 45pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	28.0	ns
91 to 98	Propagation Delay High to Low, from Clock to any Q	t_{PHL}	-	4(i)	V_{CC} = 5.0V C_L = 45pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	28.0	ns
99 to 106	Output Enable Time to High Level from Output Control to any Q	t_{PZH}	-	4(i)	V_{CC} = 5.0V C_L = 45pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	26.0	ns
107 to 114	Output Enable Time to Low Level from Output Control to any Q	t_{PZL}	-	4(i)	V_{CC} = 5.0V C_L = 45pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	28.0	ns
115 to 122	Output Disable Time to High Level from Output Control to any Q	t_{PHZ}	-	4(i)	V_{CC} = 5.0V C_L = 5pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	32.0	ns
123 to 130	Output Disable Time to Low Level from Output Control to any Q	t_{PLZ}	-	4(i)	V_{CC} = 5.0V C_L = 5pF R_L = 667Ω (Pins 2-5-6-9-12-15-16-19)	-	20.0	ns

NOTES: See Page 18

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES, +125(+0-5) °C AND -55(+5-0) °C

No.	Characteristics	Symbol	Test Method MIL-STD-883	Test Fig.	Test Conditions (Pins under Test)	Limits		Unit
						Min.	Max.	
1	Functional Test	-	-	3(b)	Verify Truth Table with Load. Note 1	-	-	-
2 to 11	Input Current High Level 1	I_{IH1}	3010	4(a)	V_{CC} = 5.5V, V_{IN} = 2.7V (Pins 1-3-4-7-8-11-13-14-17-18)	-	20	µA
12 to 21	Input Current High Level 2 at Max. Voltage	I_{IH2}	3010	4(a)	V_{CC} = 5.5V, V_{IN} = 7.0V (Pins 1-3-4-7-8-11-13-14-17-18)	-	100	µA
22 to 31	Input Clamp Voltage	V_{IC}	3008	4(b)	V_{CC} = 4.5V, I_{IN} = -18mA (Pins 1-3-4-7-8-11-13-14-17-18) Note 2	-	-1.5	V
32 to 41	Input Current Low Level	I_{IL}	3009	4(c)	V_{CC} = 5.5V, V_{IN} = 0.4V (Pins 1-3-4-7-8-11-13-14-17-18)	-	-400	µA
42 to 49	Output Voltage Low Level	V_{OL}	3007	4(d)	V_{CC} = 4.5V, I_{OL} = 12mA V_{IL} = 0.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	0.4	V
50 to 57	Output Voltage High Level	V_{OH}	3006	4(e)	V_{CC} = 4.5V, I_{OH} = -1mA V_{IL} = 0.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	2.4	-	V
58 to 65	Off State Output Current High Level Applied	I_{OZH}	-	4(h)	V_{CC} = 5.5V, V_{OUT} = 2.7V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	20	µA
66 to 73	Off State Output Current Low Level Applied	I_{OZL}	-	4(h)	V_{CC} = 5.5V, V_{OUT} = 0.4V, V_{IH} = 2.0V (Pins 2-5-6-9-12-15-16-19)	-	-20	µA

NOTES: See Page 18.

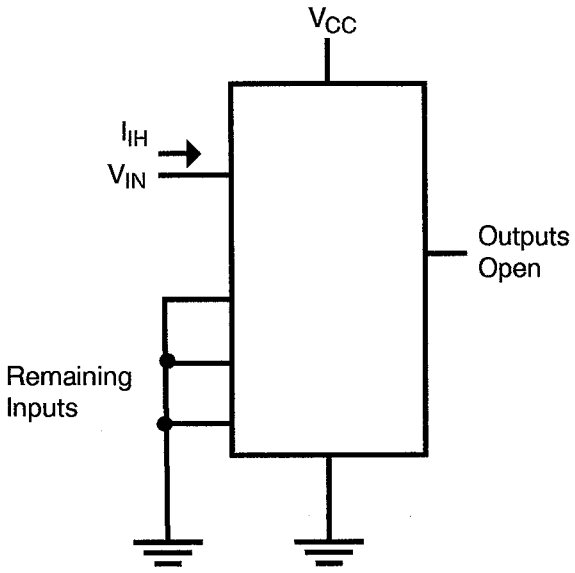
TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES, +125(-0+5) °C AND -55(+5-0) °C (CONTINUED)

No.	Characteristics	Symbol	Test Method MIL-STD-883	Test Fig.	Test Conditions (Pins under Test)	Limits		Unit
						Min.	Max.	
74 to 81	Short Circuit Output Current	I_{OS}	3011	4(f)	V_{CC} = 5.5V (Pins 2-5-6-9-12-15-16-19) Note 3	-30	-130	mA
82	Supply Current	I_{CC}	3005	4(g)	V_{CC} = 5.5V. (Pin 20)	-	40	mA

NOTES: See Page 18.

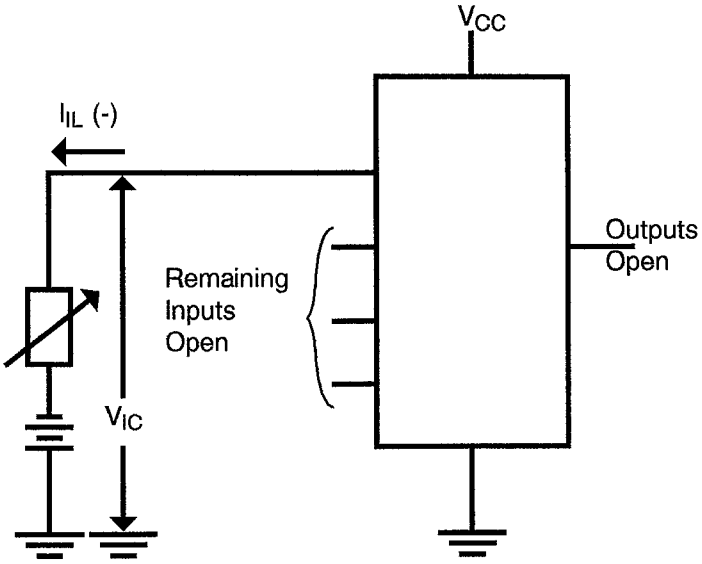
FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - HIGH LEVEL INPUT CURRENT



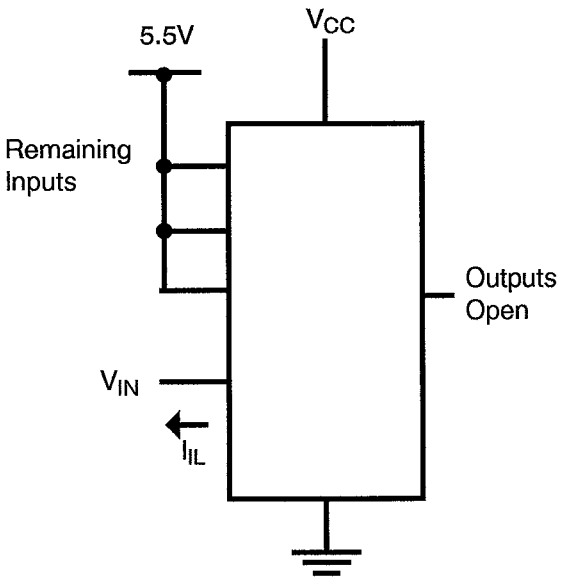
NOTES 1. Test each input separately.

FIGURE 4(b) - INPUT CLAMP VOLTAGE



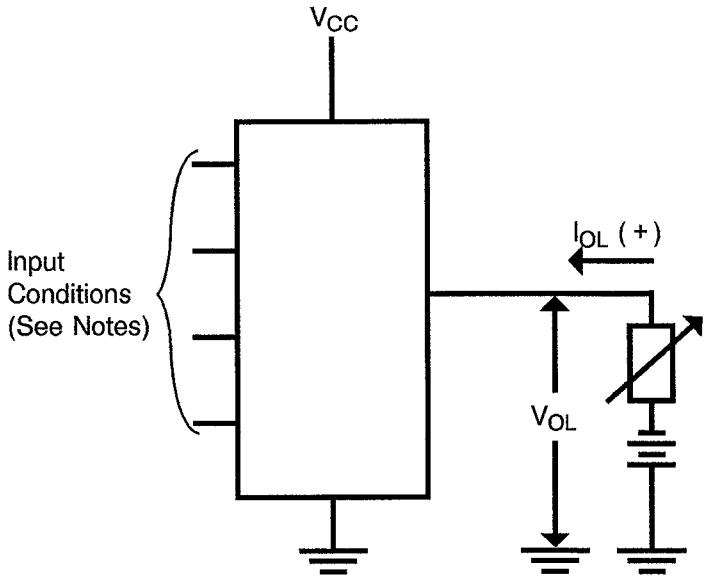
NOTES 1. Test each input separately.

FIGURE 4(c) - LOW LEVEL INPUT CURRENT



NOTES 1. Test each input separately.

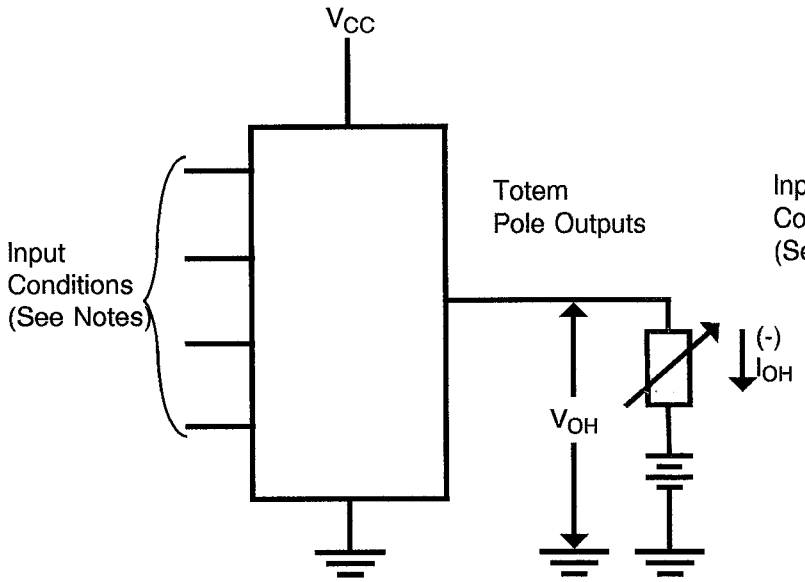
FIGURE 4(d) - LOW LEVEL OUTPUT VOLTAGE



NOTES 1. Output control and D inputs at V_{IL}.
2. Clock input at transition from low to high.

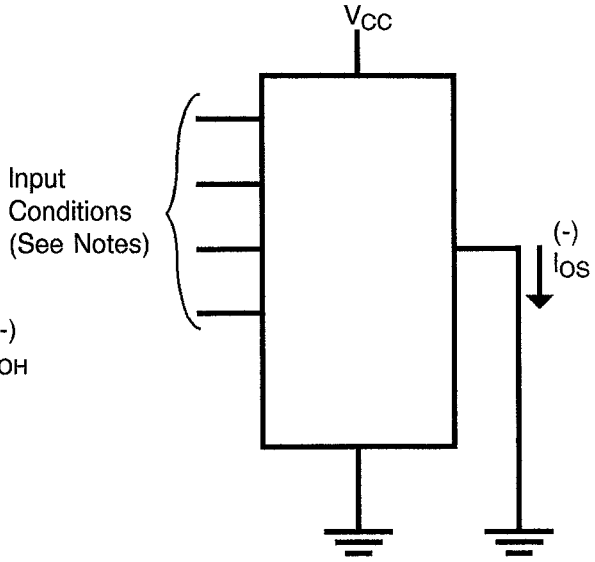
FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(e) - HIGH LEVEL OUTPUT VOLTAGE



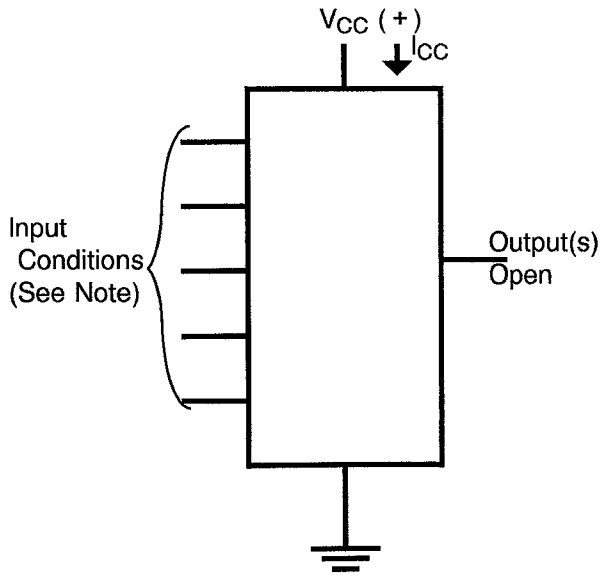
NOTES
1. Output Control at V_{IL}, D input at V_{IH}.
2. Clock input at transition low to high.

FIGURE 4(f) - SHORT CIRCUIT OUTPUT CURRENT



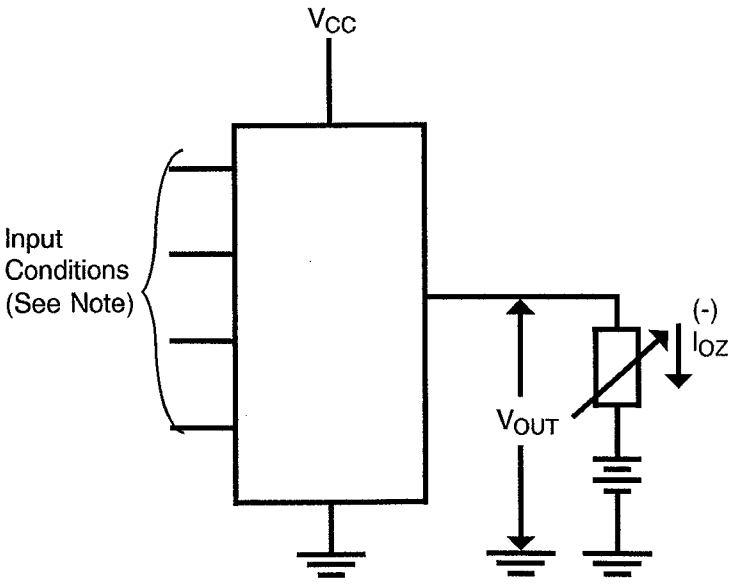
NOTES
1. Output Control at V_{IL}, D input at V_{IH}.
2. Clock input at transition from low to high.
3. No more than one output to be shorted at a time.

FIGURE 4(g) - SUPPLY CURRENT



NOTES
1. Output control at V_{IH} = 4.5V. All other inputs at V_{IL} = 0V

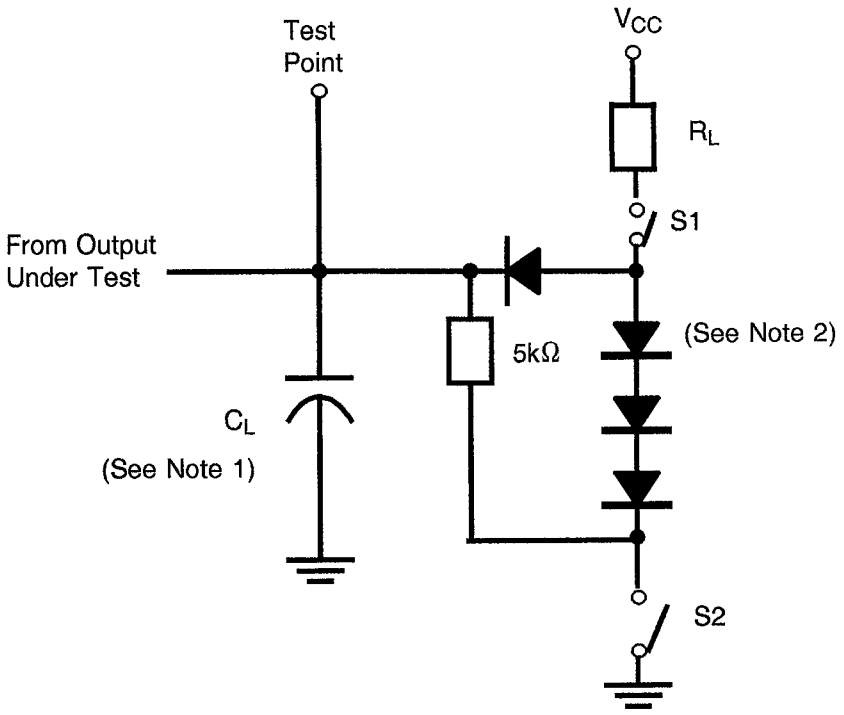
FIGURE 4(h) - OFF STATE OUTPUT CURRENT



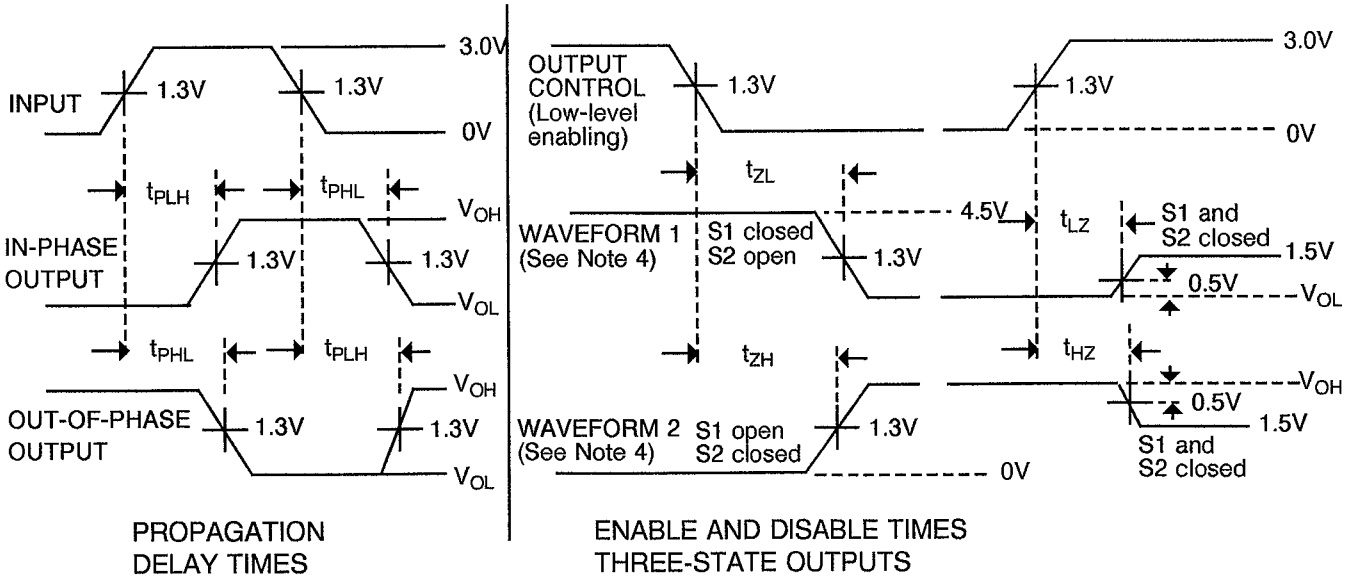
NOTES
1. Output Control and D inputs at V_{IH}.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS (CONTINUED)

FIGURE 4(i) - DYNAMIC TEST AND SWITCHING WAVEFORMS



VOLTAGE WAVEFORMS



NOTES

1. C_L = 45pF or 5pF ± 5% (See Table 2), including scope probe, wiring and stray capacitance without package in test fixture.
2. All diodes are In 916 or In 3064.
3. R_L = 667Ω ± 5%.
4. Waveform 1: Is for an output with internal conditons such that the output is low except when disabled by the output control. Waveform 2: Is for an output with internal conditons such that the output is high except when disabled by the output control.
5. All input pulses are supplied by generators having the following characteristics: PRR < 1Mhz, Z_{out} = 50Ω, t_r < 15ns and t_p < 6ns.
6. When measuring propagation delay time of 3-state outputs S_1 and S_2 are closed.

TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits (Δ)	Unit
2 to 11	Input Current High Level 1	I_{IH1}	As per Table 2	As per Table 2	±0.5 or (1) ± 20	µA %
32 to 41	Input Current Low Level	I_{IL}	As per Table 2	As per Table 2	±18	µA
42 to 49	Output Voltage Low Level	V_{OL}	As per Table 2	As per Table 2	± 60	mV
50 to 57	Output Voltage High Level	V_{OH}	As per Table 2	As per Table 2	±240	mV

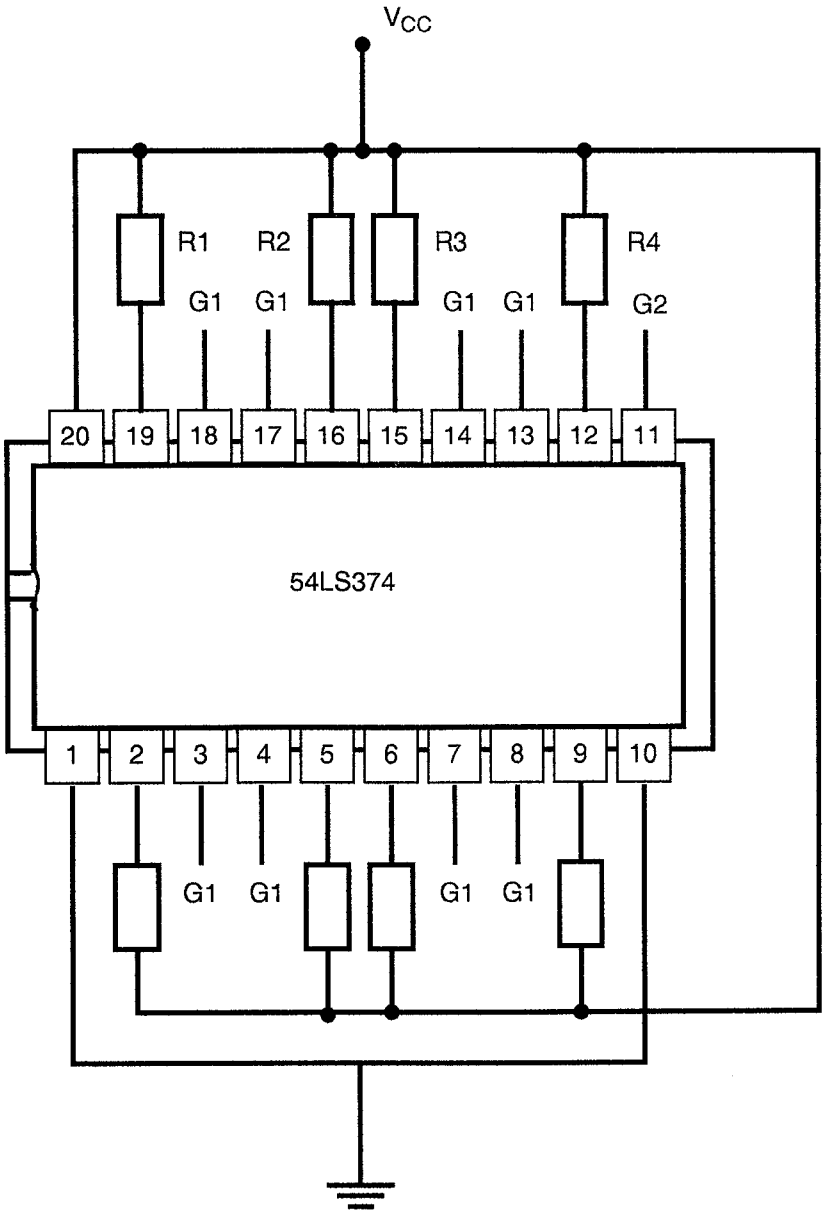
NOTES 1. Whichever is greater, referred to the initial value.

TABLE 5 - CONDITIONS FOR POWER BURN-IN AND OPERATING LIFE TEST

No.	Characteristics	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+125(+0-5)	°C
2	Power Supply Voltage	V_{CC}	+5(+0.5-0)	V
3	Pulse Voltage	V_{GEN}	0.5 max to 3.0 min	V
4	Frequency	G2 f G1	100 (Note 1) 50	Hz
5	Fan-out	-	10	-
6	Rise Time	t_r	50 max.	µs
7	Fall Time	t_f	50 max.	µs
8	Duty Cycle	-	20 min.	%

NOTES 1. Tolerance ±10%.

FIGURE 5 - ELECTRICAL CIRCUIT FOR POWER BURN-IN AND OPERATING LIFE TEST



NOTES

1. R1 to R8 = 1.2KΩ.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION No. 9000)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb} = +22 ±3 °C.

4.8.2 Electrical Measurements at Intermediate Points during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are as scheduled in Table 6 of this specification.

4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured on completion of endurance testing are as scheduled in Table 6 of this specification. Unless otherwise stated, the measurements shall be performed at T_{amb} = +22 ±3 °C.

4.8.4 Conditions for Operating Life Test

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 9000. The conditions for operating life testing shall be as specified in Table 5 of this specification.

4.8.5 Electrical Circuits for Operating Life Tests

Circuits for use in performing the operating life test is shown in Figure 5 of this specification.

4.8.6 Conditions for High Temperature Storage Test

The requirements for high temperature storage test are specified in ESA/SCC Generic Specification No. 9000. The conditions for high temperature storage shall be T_{amb} = +150(+0-5) °C.

TABLE 6 - ELECTRICAL MEASUREMENTS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTS

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits		Unit
					(Δ)	Absolute	
2 to 3	Input Current High Level 1	I_{IH1}	As per Table 2	As per Table 2	±1.0	-	µA
12 to 21	Input Current High Level 2	I_{IH2}	As per Table 2	As per Table 2	-	100	µA
32 to 41	Input Current Low Level	I_{IL}	As per Table 2	As per Table 2	±12	-	µA
42 to 49	Output Voltage Low Level	V_{OL}	As per Table 2	As per Table 2	± 60	-	mV
50 to 57	Output Voltage High Level	V_{OH}	As per Table 2	As per Table 2	±240	-	mV
82	Supply Current Outputs High	I_{CC}	As per Table 2	As per Table 2	± 20	-	%

APPENDIX 'A'

AGREED DEVIATIONS FOR TEXAS INSTRUMENTS (FRANCE)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.1	Scanning Electron Microscope (S.E.M.) Inspection may be performed using TIF document TIF 3.61.610.001.
Para. 4.2.2	Prior to Die Shear Test TIF may perform a Radiographic Inspection on the randomly chosen samples to be subjected to this test, using TIF document TIF 50.42-3002.
Para. 4.2.3	Radiographic Inspection may be performed using TIF document TIF 50.42-3002.